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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/501,146	07/13/2004	Ronny Losfeld	016782-0309	6103

22428 7590 10/16/2008
FOLEY AND LARDNER LLP
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EXAMINER

HAN, KWANG S

ART UNIT	PAPER NUMBER
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1795

MAIL DATE	DELIVERY MODE
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10/16/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/501,146	Applicant(s) LOSFELD ET AL.	
	Examiner Kwang Han	Art Unit 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 6/23/08.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9 and 11-21 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9 and 11-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 June 2008 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. The Amendment filed June 28, 2008 has been entered. Claims 1-9 and 11-21 remain pending in the application. Applicant has cancelled claims 10 and 22. The objections to the drawings and specification have been withdrawn in light of Applicant's amendments to the drawings and specifications. The objections to claims 1-19, 21, and 22 have been withdrawn in light of Applicant's amendments to the claims. The previous 35 USC 101 and 112 rejection has been withdrawn in light of applicant's cancellation of claim 22.

Claim Rejections - 35 USC § 103

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
3. Claims 1, 2, 4, 8, and 12-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cisar et al. (US 6232010, previously cited).

Regarding claim 1, Cisar et al. is directed to a fuel cell (electrochemical reactor [Abstract]) comprised of:

- a collector layer (Figure 15 Element 112, foil separator), diffusion layer (Figure 15 Element 104, distribution layer), and an anchoring layer (Figure 15 Element 102, porous flow field),
- collector layer being a metal foil or plate (Column 9 Line 36),
- diffusion layer being sheet of metal mesh (sintered metal fibers) (Column 5, Lines 5-6; Column 9 Lines 6-7; Claim 8),
- anchoring layer comprised of metal fibers (Column 5 Lines 2-6; Claim 10),

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- anchoring layer provided between collector layer and diffusion layer (Figure 15), and
- collector layer, anchoring layer, and diffusion layer being sintered to each other (Column 9 Lines 45-49).

Cisar et al. is silent in the embodiment shown in Figure 15 of having a contact layer on the opposing side of the diffusion layer and the anchoring layer having a thickness of less than 0.5 mm.

Applicant discloses in the instant application within the specification that both the anchoring layer and the contact layer are both comprised of metal fiber (Page 3 and 6 of the specifications).

It would have been obvious to one of ordinary skill in the art at the time of the invention to apply Cisar's flow field layer (Figure 15) as a contact layer on the opposing side of the diffusion layer (Figure 15) for the benefit of supporting the substrates during sintering and for optimal electrical and thermal conductivity (Column 8, Line 64-Column 9, Line 5).

It would also have been obvious to one of ordinary skill in the art at the time of the invention to apply Cisar's flow field layer (Figure 15) as a contact layer on the opposing side of the diffusion layer since the courts have held that duplication of parts was obvious. In re St. Regis Paper Co. v. Beemis Co. Inc. 193 USPQ 8,11(1977); In re Harza 124 USPQ 378 (CCPA 1960).

Cisar discloses that it's generally known in the art to decrease the thickness of fuel cell plates (Column 2 Lines 59-61) because it is commonly known in the art that

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minimizing the plate thickness reduces the distance required for reactants to travel to the reactant sites and that the thickness of the porous substrates are dictated by the considerations for the materials physical integrity (Column 8, Lines 64-66).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use a anchoring layer thickness of 0.5 mm or less since it has been held that discovering the optimum ranges for a result effective variable such as the thickness of the anchoring layer involves only routine skill in the art in the absence of showing of criticality in the claimed range. See *In re, Boesch* 617 F.2d 272, 205 USPQ 215 (CCPA 1980) and (See MPEP 2144.05).

Regarding claim 2, Cisar discloses a fuel cell or electrolyzer comprising of two diffusion layers and two anchoring layers disposed between the diffusion layer and collector layer, with the anchoring and diffusion layers being on opposing sides of the collector layer (Figure 15).

Regarding claim 4, Cisar discloses an anchoring layer having a porosity of 95% (Column 7, Line 50). This was determined using applicants disclosed definition of porosity on page 8 of specification.

Regarding claim 8, Cisar et al. discloses a porous metal flow field comprised of an expanded metal sheet and a combination of a flow field and diffusion layer having a thickness of less than 1.2mm (Column 7, Lines 53-55, compressed to 1.22mm (0.48 in)).

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It would have been obvious to one of ordinary skill in the art at the time of the invention to use an expanded metal sheet as the diffusion layer since the structure of Cisar's flow field act essentially as a diffusion layer capable of diffusion.

Regarding claim 12, the teachings of Cisar as discussed above are herein incorporated.

Cisar discloses that the thickness of the porous substrates are dictated by the considerations for the materials physical integrity (Column 8, Lines 64-66) teaching the thickness as a result effective variable.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use a contact layer having a thickness of less than 0.2 mm or less since it has been held that discovering the optimum ranges for a result effective variable such as the thickness of the anchoring layer involves only routine skill in the art in the absence of showing of criticality in the claimed range. See *In re, Boesch* 617 F.2d 272, 205 USPQ 215 (CCPA 1980) and (See MPEP 2144.05).

Regarding claims 13 and 14, Cisar does not disclose a fuel cell or electrolyzer with an air permeability flow rate (Column 8 Lines 21-35) as claimed by the applicant, but does recognize that air permeability is a result effective variable dependant upon processing and material selection for the components (Column 8, Lines 36-43).

It would have been obvious to one of ordinary skill in the art at the time of the invention vary the air permeability flow rate since it has been held that discovering the optimum ranges for a result effective variable such as the air permeability flow rate

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involves only routine skill in the art in the absence of showing of criticality in the claimed range. See *In re, Boesch* 617 F.2d 272, 205 USPQ 215 (CCPA 1980) and (See MPEP 2144.05).

Regarding claim 15, 16, and 17 Cisar discloses a fuel cell or electrolyzer with an anchoring layer being comprised of stainless steel, nickel or nickel alloy, and titanium (Claim 11).

Regarding claim 18 and 19, Cisar discloses all of the layers of the fuel cell or electrolyzer being provided of the same metal or alloy (Claim 31, 36).

Regarding claims 20, Cisar discloses a fuel cell (electrochemical reactor) comprising at least one stack (Abstract).

4. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cisar et al. as applied to claim 1 above and further evidenced by Winter (www.webelements.com, nickel, previously cited).

Regarding claim 3, Cisar discloses an anchoring layer having a weight of less than 350 g/m^2 as evidence by the use of a nickel foam material for the anchoring layer (Column 7 Lines 45-60). Using applicants disclosed thickness of 0.5mm at nominal density of 5% as disclosed in Cisar (Column 7 Line 50) and using the density of solid nickel at 8908 kg/m^3 (Winter, nickel properties), the calculated density for the metal foam would be 22.25 g/m^2 .

5. Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cisar et al. as applied to claim 1 above, and further in view of Yamashita et al. (US 5441822, previously cited).

Regarding claim 5, Cisar et al. do not disclose a diffusion layer having an open area of more than 30%, but Cisar does disclose the formation of a porous metal component (Column 5, Lines 2-6; both the flow field and diffusion layer can be formed from sintered metal particles) of a controlled porosity by controlling the size distribution of the spheres and the sintering conditions (Column 8 Line 36-42) recognizing that porosity is a result effective variable.

Yamashita discloses a diffusion layer within a fuel cell having a porosity of about 70% (Column 6 Lines 47-48).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use have Yamashita's diffusion layer porosity in Cisar's diffusion layer because it is well known in the art to use a diffusion layer with sufficient porosity to allow for permeability.

Regarding claim 6, Cisar et al. do not disclose a diffusion layer thickness. Yamashita teaches the use of a diffusion layer having a thickness of about 1.6mm for a fuel cell (Column 5, Line 32) and teaching that the thickness of the diffusion layer has an effect on the fuel cell output teaching it as a result effective variable (Column 5, Lines 36-53).

It would have been obvious to one of ordinary skill in the art at the time of the invention vary the thickness of the diffusion layer since it has been held that discovering the optimum ranges for a result effective variable such as the thickness of the diffusion layer involves only routine skill in the art in the absence of showing of criticality in the

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claimed range. See *In re, Boesch* 617 F.2d 272, 205 USPQ 215 (CCPA 1980) and (See MPEP 2144.05).

6. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cisar et al. as applied to claim 1 above, and further in view of Faita et al. (US 5482792, previously cited).

Regarding claim 7, the teachings of Cisar et al. as disclosed above are herein incorporated. Cisar et al. discloses a diffusion layer comprised of a metal mesh but is silent as to the wire having a diameter of more than 0.5mm.

Cisar and Faita are analogous art because both teach the use of metal meshes to allow for fluid flow in fuel cells.

Faita teaches a current collector of a fuel cell that is composed of wires with the diameter between 0.01 and 1 mm (Column 9 Lines 2-3; Column 7, Lines 24-27) for the benefit of optimizing the void ratio.

It would have been obvious to one of ordinary skill in the art to use Faita's wire diameter for the wires in Cisar's metal mesh wire for the benefit of optimizing the void content to help distributing the gases for the electrochemical reaction.

7. Claims 9 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cisar et al. as applied to claims 1 and 10 above, and further in view of Reichner (US 4791035, previously cited).

Regarding claims 9 and 11, Cisar is silent towards the thickness of the metal fibers of the anchoring layer.

Cisar and Reichner are analogous art because both teach the use of metal fibers in a structure used to form a porous body in a fuel cell.

Reichner teaches a fibrous metal strip in an electrolyte electrochemical cell with the fibers ranging in diameter from 0.0013 cm to 0.025 cm (Column 6 Lines 29-32).

It would have been obvious to use Reichner's metal fiber diameters in Cisar's anchoring layer metal fibers because it is desirable to minimize the diameter of the fibers to increase porosity.

8. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cisar et al. as applied to claim 1 above, and further evidenced by Hollenberg (US 5512145).

Cisar et al. discloses an electrochemical reactor and more specifically a fuel cell but is silent as to a electrolyzer [Abstract].

Hollenberg teaches that a fuel cell can operate in reverse as an electrolyzer to produce hydrogen (Column 4, Lines 38-40).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use Cisar's electrochemical reactor as a electrolyzer as it is well known to one of ordinary skill in the art as evidenced by Hollenberg.

Response to Arguments

9. Applicant's arguments, see Remarks, filed June 28, 2008, with respect to the rejection(s) of claim(s) 1 under Cisar et al. in view of Ramunni have been fully considered and not persuasive. In light of the amended matter, the rejection has been withdrawn. A new ground(s) of rejection is made in view of Cisar et al. alone.

Applicant argues in page 10 of the Remarks that Cisar does not disclose a metal mesh. Cisar teaches sintered metal fibers which would form the applicant's disclosed metal mesh. The argument that Cisar does not teach a metal mesh is not persuasive. An interpretation of the term metal mesh can include a structure formed from the sintering of metal fibers. New grounds of rejection show how Cisar et al. discloses a contact layer as defined in the claim.

10. Applicant's argues on page 11 of Remarks with respect to the rejection of claims 10 and 12 under Cisar et al. and Ramunni further in view of Simpkins have been fully considered and are persuasive. Therefore, the rejection has been withdrawn.

However, upon further consideration, a new ground(s) of rejection for claim 12 is made in view of Cisar et al. The limitations of claim 10 have been included in the applicants amendment of claim 1 and the new rejection of claim 1 will reflect the newly amended matter.

11. Applicant's arguments with respect to claims 2-4, 5-9,11, and 13-22 have been considered but are moot in view of the new ground(s) of rejection. Applicant argues that these dependant claims fail to remedy the deficiencies of Cisar and Ramunni. The applicant's arguments are not persuasive. New grounds of rejection have been made for the claims in view of the amended matter.

Contact/Correspondence Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kwang Han whose telephone number is (571) 270-

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5264. The examiner can normally be reached on Monday through Friday 8:00am to 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Susy Tsang-Foster can be reached on (571) 272-1293. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/K. H./

Examiner, Art Unit 1795

/SUSY N TSANG-FOSTER/

Supervisory Patent Examiner, Art Unit 1795